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Temperature and frequency dependence of the spin-lattice relaxation times of E′1 centers in neutron-irradiated quartz glass

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Abstract

Results are reported for measurements of the spin-lattice relaxation times of E′1 centers in quartz glass, produced by neutron irradiation, with the measurements made at two frequencies 9.25 and 24.0 GHz over a wide temperature interval 1.5-300 K. The experimental data are interpreted on the basis of interaction mechanisms of the spins with two-level systems with excitation energies ~6, ~26, and ~420 cm-1. A small modification of the existing theory allows us to explain a number of features of the observed temperature and frequency dependence of the relaxation rate. The results are compared with the data available in the literature on spin-lattice relaxation of irradiation centers in crystalline quartz and quartz glass.